

# Clinician Gestalt Estimate of Pretest Probability for Acute Coronary Syndrome and Pulmonary Embolism in Patients With Chest Pain and Dyspnea

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**Study objective:** Pretest probability helps guide diagnostic testing for patients with suspected acute coronary syndrome and pulmonary embolism. Pretest probability derived from the clinician's unstructured gestalt estimate is easier and more readily available than methods that require computation. We compare the diagnostic accuracy of physician gestalt estimate for the pretest probability of acute coronary syndrome and pulmonary embolism with a validated, computerized method.

**Methods:** This was a secondary analysis of a prospectively collected, multicenter study. Patients (N=840) had chest pain, dyspnea, nondiagnostic ECGs, and no obvious diagnosis. Clinician gestalt pretest probability for both acute coronary syndrome and pulmonary embolism was assessed by visual analog scale and from the method of attribute matching using a Web-based computer program. Patients were followed for outcomes at 90 days.

**Results:** Clinicians had significantly higher estimates than attribute matching for both acute coronary syndrome (17% versus 4%;  $P < .001$ , paired  $t$  test) and pulmonary embolism (12% versus 6%;  $P < .001$ ). The 2 methods had poor correlation for both acute coronary syndrome ( $r^2 = 0.15$ ) and pulmonary embolism ( $r^2 = 0.06$ ). Areas under the receiver operating characteristic curve were lower for clinician estimate compared with the computerized method for acute coronary syndrome: 0.64 (95% confidence interval [CI] 0.51 to 0.77) for clinician gestalt versus 0.78 (95% CI 0.71 to 0.85) for attribute matching. For pulmonary embolism, these values were 0.81 (95% CI 0.79 to 0.92) for clinician gestalt and 0.84 (95% CI 0.76 to 0.93) for attribute matching.

**Conclusion:** Compared with a validated machine-based method, clinicians consistently overestimated pretest probability but on receiver operating curve analysis were as accurate for pulmonary embolism but not acute coronary syndrome. [Ann Emerg Med. 2014;63:275-280.]

Please see page 276 for the Editor's Capsule Summary of this article.

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## INTRODUCTION

### Background

Pretest probability can effectively guide the choice of diagnostic testing and empiric treatment of patients with signs or symptoms of acute coronary syndrome or pulmonary embolism.<sup>1-6</sup> Several methods accurately estimate pretest probability for acute coronary syndrome and pulmonary embolism. These include scoring systems or criteria derived from regression analysis, machine-derived values, or an unstructured approach, sometimes referred to as clinical gestalt.<sup>1-7</sup>

### Importance

Many clinicians prefer to use clinical gestalt because it is always available, requires no lookup device to remember, and allows the

flexibility of thought.<sup>8</sup> Multiple studies have found that physician gestalt compares favorably to structured methods of pretest probability assessment for both acute coronary syndrome and pulmonary embolism.<sup>1,5,9</sup> Patients commonly exhibit signs, symptoms, and risk factors that suggest inclusion of both acute coronary syndrome and pulmonary embolism in the differential diagnosis.<sup>10</sup> Many clinicians become concerned about acute coronary syndrome and pulmonary embolism in patients who have both chest pain and dyspnea, and order a large number of tests to diagnose very few cases.<sup>11</sup> Access to an easy-to-use, reliable method of pretest probability may help reduce unnecessary testing.<sup>11</sup>

### Goals of This Investigation

We compare the diagnostic accuracy, agreement, and correlation between emergency physician gestalt estimate of the pretest probability of acute coronary syndrome and pulmonary embolism with a validated, computer-derived technique.<sup>12,13</sup>

**Editor's Capsule Summary***What is already known on this topic*

Clinical judgment is imperfect for ruling out acute coronary syndrome and pulmonary embolism.

*What question this study addressed*

The study addressed whether computerized attribute matching performs better than clinical gestalt for diagnosis of acute coronary syndrome and pulmonary embolism.

*What this study adds to our knowledge*

In a prospective cohort study of 840 patients, attribute matching outperformed clinical gestalt for diagnosis of acute coronary syndrome but not pulmonary embolism. Clinical gestalt resulted in higher estimates of likelihood of acute coronary syndrome (17% versus 4%) and pulmonary embolism (12% versus 6%) in a relatively low-risk population (2.7% acute coronary syndrome; 1.8% pulmonary embolism).

*How this is relevant to clinical practice*

Clinicians should recognize that they overestimate pretest probability and consider recalibrating their gestalt assessments or embracing more objective risk-stratification tools to assist decisionmaking.

**MATERIALS AND METHODS****Study Design**

This is a secondary analysis of a prospective, 4-center study that collected data from 3 academic emergency departments (EDs) and 1 community ED.<sup>11</sup> The clinical trials identifier for this trial is NCT01059500. Subjects in this study included clinicians and patients, all of whom gave written informed consent.

**Selection of Participants**

Patients were adults with undifferentiated chest pain and shortness of breath as all or part of their chief complaint(s). Under partial waiver of authorization, research assistants identified potential patients by visual survey of the chief complaint registered on the ED's real-time electronic tracking system. The research assistant then determined whether the patient met inclusion and exclusion criteria.

Inclusion criteria were adult (>17 years) ED patients with a history of chest discomfort of any quality and new or worsened shortness of breath or breathing difficulty documented in the written history of present illness or review of systems, that patients understood English or had a certified translator present for their primary language, that the physician had ordered or planned to order

a 12-lead ECG, and that the patient had indicated the site hospital was his or her hospital of choice in the event of return ED visit.<sup>14</sup>

Exclusion criteria were the following: a 12-lead ECG with ST deviation interpreted as acute infarction or ischemia, computer interpretation of the 12-lead ECG containing either "ischemia" or "infarction," known diagnosis of acute pulmonary embolism within the previous 24 hours (eg, callback for overread of a computed tomography [CT] scan), "code STEMI" patients (patients with suspected ST-segment elevation acute myocardial infarction), other obvious condition or diagnosis identified by the emergency physician as mandating admission (evidence of circulatory shock, severe hypoxemia, decompensated heart failure, altered mental status, hemorrhage, sepsis syndrome, arrhythmia, trauma, unstable social or psychiatric situation, stroke, aortic disaster, or pneumonia), myocardial infarction, intracoronary stent placement, or coronary artery bypass grafting within the previous 30 days, known cocaine use within the past 72 hours according to patient or laboratory report, referral to the ED by a personal physician for admission, patients undergoing voluntary medical clearance for a detox center or any involuntary court or magistrate order, homelessness, out-of-town residence or other condition known to preclude follow-up, patients in police custody or currently incarcerated individuals, and patients who knew they were pregnant or for whom a pregnancy test was conducted as part of usual care and was found to be positive. Postenrollment exclusions included a positive urine cocaine test result, incarceration within 14 days of enrollment, or patient elopement from medical care (ie, patients who left against medical advice). All patients and providers supplied written informed consent to participate in this study.

Clinical data were collected in accordance with the Standards for Reporting Diagnostic Accuracy initiative, as well as the 2004 standardized reporting guidelines for studies evaluating risk stratification of ED patients with potential acute coronary syndrome.<sup>15,16</sup>

The clinician in charge of the decisionmaking provided data needed for pretest probability assessment. Clinicians were board-certified faculty physicians, postgraduate year 3 residents, and physician assistants. Pretest probability was assessed with the clinician's gestalt estimate and the method of attribute matching for both acute coronary syndrome and pulmonary embolism. Both methods produced a numeric percentage probability, ranging from 0% to 100%.<sup>12,13</sup>

Briefly, attribute matching is a computer program that matches a profile of clinical predictors (8 for acute coronary syndrome and 10 for pulmonary embolism) that are input by the clinician. The program then sorts through 2 large databases containing the same variables of patients who were previously evaluated for possible acute coronary syndrome and pulmonary embolism and extracts only the patients who have exact matches with the profile of the patient under consideration. This process results in a denominator of all matched patients and numerator of patients with acute coronary syndrome or pulmonary embolism, and the quotient reveals the pretest probability that can be expressed as a percentage value.

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